

## CLAIMS

1. A positive-type resist composition for liquid immersion lithography comprising:

a resin component (A), increasing alkali-solubility by acid action; and

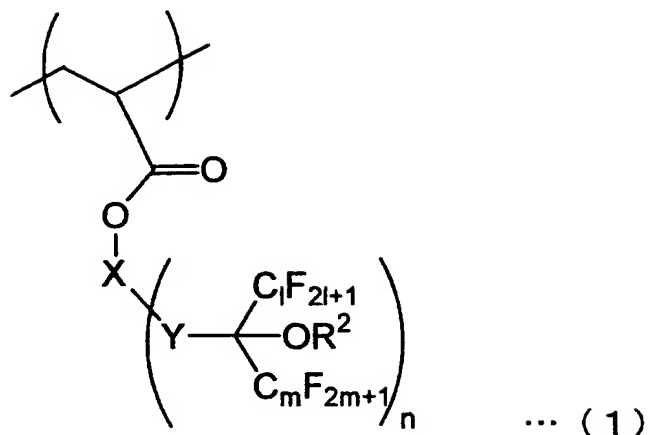
an acid generator component (B), generating acid by exposure,

wherein, the resin component (A) contains at least one acrylic ester constitutional unit (a1), and one (meth)acrylic ester constitutional unit (a2) having acid dissociable, dissolution inhibiting group,

the constitutional unit (a1) consisting of a cyclic group bonded to an acrylic ester of the constitutional unit (a1), and a fluoro organic group bonded to the cyclic group, and

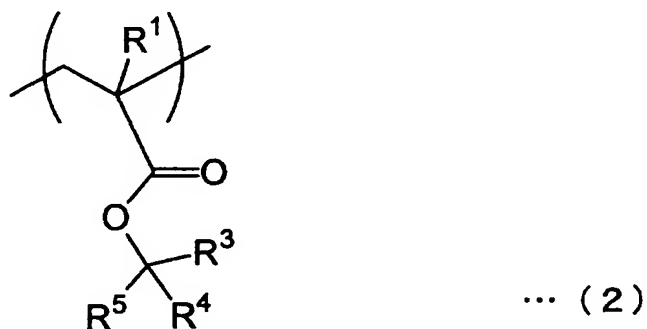
the fluoro organic group being formed by at least partially substituting hydrogen atoms of an organic group with fluorine atoms, and having a substituted or unsubstituted alcoholic hydroxyl group.

2. The positive-type resist composition for liquid immersion lithography according to Claim 1, wherein the constitutional unit (a1) is expressed by the following general formula (1),



in which, X represents a divalent or trivalent cyclic group; and Y represents a divalent alkylene or alkyloxy group having 1 to 6 carbons;  $R^2$  represents a hydrogen atom, a chain, a branched or a cyclic alkyloxymethyl group having 1 to 15 carbons; l and m respectively, are integers from 1 to 5; and n is an integer of 1 or 2.

3. The positive-type resist composition for liquid immersion lithography according to Claim 1 or 2, wherein the constitutional unit (a2) is expressed by the following general formula (2),



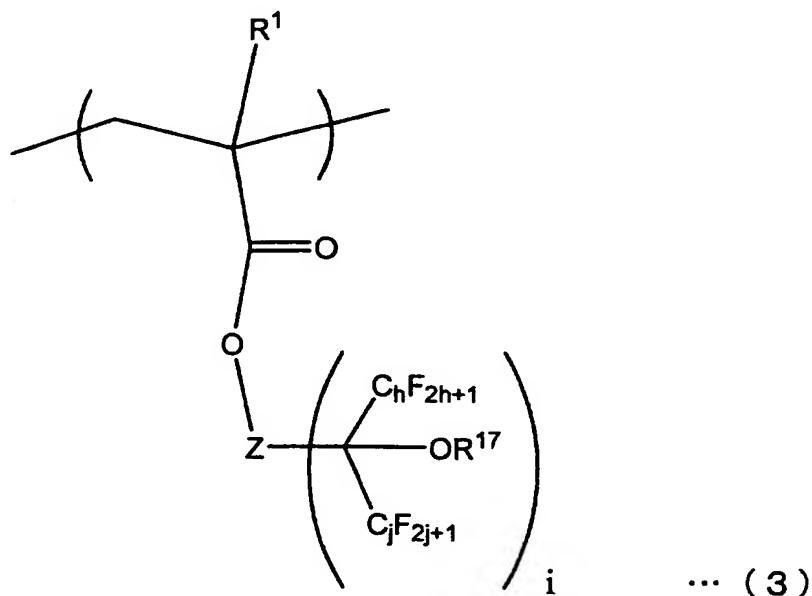
in which,  $R^1$  represents a hydrogen atom or a methyl group;  $R^3$  to  $R^5$  represents an alkyl group having 1 to 10 carbons, which may be the same or different from each other;

and at least two alkyl groups among these may bind to form the cyclic groups.

4. The positive-type resist composition for liquid immersion lithography according to any one of Claims 1 to 3, wherein the resin component (A) further comprises: one or more constitutional units (a3), which are different from the constitutional units (a1) and (a2).

5. The positive-type resist composition for liquid immersion lithography according to Claim 4, wherein the unit (a3) is the constitutional unit (a4) induced from a (meth)acrylic acid having a monocyclic or a polycyclic group containing lactone.

6. The positive-type resist composition for liquid immersion lithography according to Claim 4, wherein the unit (a3) is expressed by the general formula (3),



in which, Z represents a divalent or a trivalent cyclic group; R<sup>1</sup> represents a hydrogen atom or a methyl group; R<sup>17</sup> represents a hydrogen atom, a chain, a branched or a cyclic alkyloxymethyl group having 1 to 15 carbons; and h and j respectively, are integers from 1 to 5; and i is an integer of 1 or 2.

7. The positive-type resist composition for liquid immersion lithography according to any one of Claims 1 to 6, wherein a cyclic group in the constitutional unit (a1) is an aliphatic cyclic group.

8. The resist composition for liquid immersion lithography according to Claim 7, wherein the alicyclic group is a polycyclic aliphatic hydrocarbon group.

9. The resist composition for liquid immersion lithography according to Claim 8, wherein the polycyclic aliphatic hydrocarbon group is a norbornyl group.

10. The resist composition for liquid immersion lithography according to any one of Claims 1 to 9, wherein an acid dissociable, dissolution inhibiting group in the constitutional unit (a2) is a polycyclic aliphatic hydrocarbon group.

11. The resist composition for liquid immersion lithography

according to Claim 10, wherein the polycyclic aliphatic hydrocarbon group is an adamantanyl group.

12. The resist composition for liquid immersion lithography according to any one of Claims 1 to 11, wherein a medium for liquid immersion lithography is water.

13. A method for forming a resist pattern using a liquid immersion lithography process comprising the steps of:

forming a photoresist film onto a substrate by using at least the positive-type resist composition according to any one of Claims 1 to 12;

disposing an immersion solvent onto the substrate on which the resist film is laminated;

selectively exposing the resist film via the immersion fluid;

conducting a heat process as required; and  
developing the resist film.